

**Title:       Sofa-bed with innovative elements for assembly  
                  and position adjustment**

**Applicant: Gruppo Industriale Styling**

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Technical field

The present invention relates to a convertible sofa bed provided with an innovative position adjustment mechanism and a fast assembly process.

10 In the state of the technique there are already some realizations of convertible sofa beds. They normally comprise (Fig. 1) padding elements, a base structure (1), and a kinematic mechanism (3) to change the frames positions; the required features of said sofa beds are an easy assembly process, an easy  
15 conversion from bed configuration to a sofa configuration and vice versa, and also to be comfortable.

The applicant, in this field for many years, has already patented (EP 1020142) a sofa bed characterised by a kinematic mechanism that allows the front legs wheels to stay close to the  
20 ground in both positions, a mechanism which blocks the relative rotation between the seat frame and the back frame and a simplified assembly process.

Notwithstanding the remarkable inventive step in this technical field, this invention is still characterised by some drawbacks.  
25 First of all, the machining tolerances cannot ensure a good

coupling between the base structure and the frames. Moreover, though very simple, the assembly process needs several bolts and, consequently, a long assembly time.

5 Disclosure of the invention

The invention is characterized by distinguished standard on the market thanks to fact that it is a sofa which comprises padding elements, a base structure (1) a plurality of frames (2), mutually hinged, supported by said base structure and supporting said  
10 padding elements, and a kinematic mechanism (3) allowing the frames shift and stop in the desired positions; moreover, the base structure comprises two identical elements, named "small legs" (4), a spacer (5), and is characterised by a "hinge" plate (6), fixed on the small leg (4), which consists of two flat surfaces with an  
15 almost rectangular hole (7); said hole is tapered on one side (8) to lodge the spacer (5). This assembly procedure removes the clearance in the coupling between the hinge (6) and the spacer (5) and obtains a perfect perpendicularity between the spacer and the "small leg" (4).

20 According to a subsequent aim the base structure assembly is realized by two bolts only.

These and other advantages will be pointed out in the detailed description of the invention that will refer to the figures of tables 1/5 , 2/5, 3/5, 4/5 and 5/5, in which a preferred and not  
25 restrictive embodiment is shown.

### Way of carrying out the invention

With reference to the above mentioned tables:

- Fig. 1 is the sofa structure according to the invention;
- 5 • Fig. 2 shows the base structure ;
- Figs. 3 and 4 show a detail of the plate called “hinge”, respectively;
- Fig. 5 shows the hinge between plate and frame;
- Fig. 6 shows the detail of the shaped pin;
- 10 • Fig. 7 shows the coupling between cam and roll;
- Fig. 8 shows the front leg of the structure;
- Fig. 9 shows the fastening of the front leg;
- Fig. 10 shows a detail of the second fixation plate.

As already mentioned, the main purpose of the invention is to  
15 reduce as much as possible the clearance of the sofa base structure (1). Fig. 2 shows the sofa base structure that supports the hinged frames in the bed and sofa configurations, and comprises two identical elements, called “small legs” (4), and a spacer (5). Such a spacer is a rectangular pipe, which constrains  
20 and lets the two “small legs” be parallel to each other. In Fig. 3 is shown the plate (6) which allows the assembly between “small leg” and spacer. Said plate consists of two flat surfaces and, due to its function, is called “hinge”. It is fixed on the “small leg” and has an almost rectangular hole (7), with a tapered side (8).  
25 As observed in Fig. 4, tightening the bolt (9), the spacer (5) is

forced in the tapering (8) of the holes (7). Therefore, thanks to this assembly process, three important conditions are matched: the clearance elimination in the coupling between hinge (6) and spacer (5); the perfect perpendicularity between spacer (5) and small leg (4); the assembly of the sofa base structure by means of two bolts only (one for each leg).

Another function of the plate called "hinge" (6) is to articulate a frame (10) around a hole (11), as shown in Fig. 5. The frame rotates, moving from a horizontal position to a second desired position defined by a block element. The desired position is defined by the holes on the frame, meaning that to change inclination one should change the hole. The rotation axis and the block element are realized by a shaped pin (12), whose end (12'), engaged into a hole of the frame, works as a rotation axis; while the pin portion (12'') works as a block element of the frame. A return spring moves the pin: loosing the spring tension, the pin is inserted in both holes of the two "hinge" plates (6). By a simple movement and without any tool, the frame (10) can be disengaged and fixed on another hole, obtaining a different inclination of the sofa back.

On the free end of the "small leg" (4) there is a roller (13) whose cross section is complementary to the profile of a cam (14) to lodge it when the mechanism is in the sofa configuration, as shown in Fig. 7. The roller has a central groove (13'), few millimetres wide, in which the cam is lodged. This allows the

self-centring of the cam and the roll, preventing bad functioning due to misalignment. A second element (15) is connected to the cam (14). It is named "front leg" and can rotate around an axis up to a certain interval, as shown in Fig. 8. Like with the sofa seat, also the front leg (15) should be fixed to a certain angle. The desired position is obtained by an additional plate (16), which is fixed by a single bolt and has two block elements: the first one (18) realized on the leg, the second one realized on the cam. By means of these block elements, the plate keeps the leg in the desired position. The block elements can be realized by pins, either inserted in complementary holes or working on the external profile of the leg (15) or the cam (14). In Fig. 9, an embodiment of the described plate is shown. A further functional feature of the fixing plate is a portion (20) at 90 degrees to the fixed one, having a number of holes, to be used to fix the panels of different sofa models.

As mentioned, a further aim of the invention is the reduction of the number of bolts in the sofa assembly procedure. The known art requires 14 bolts, the present invention only 6. In fact, each side of the frame has 3 bolts: the first one to fix the spacer (5) to the "small leg" (4), the second to fix the cam (14) to the frame and the third one to fix the back leg (21) to the seat frame (2).